RESIDENTIAL FIRE SAFETY INSTITUTE

"FIRE SAFETY FOR HOMES TO HIGH-RISES"

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Operation Life Safety
Flagship program of the RFSI

The Honorable Gary McDowell, Sponsor
The Honorable Barbara Farrah, Chair
Michigan House of Representativ es
P.O. Box 30014
Lansing, MI 48909-7514

October 31, 2007

Dear Representatives McDowell & Farrah:

Re: HB 5341

As director of the Residential Fire Safety Institute (RFSI), and as a former state fire marshal and lifetime advocate of fire prevention and a reasonably fire-safe environment, I was pleased to learn that the Michigan legislature is contemplating a statute (H.B. 5341) requiring carbon monoxide (CO) detection in all new residential construction. This proposed bill would represent an important step forward in enhancing life safety. I urge the Michigan House of Representatives to take up this bill at Committee and work for its passage before Adjournment.

The RFSI is a non-profit corporation dedicated to the reduction of the loss of life and property to residential fire. While carbon monoxide deaths and illnesses are not typically considered fire deaths in the traditional sense, these tragedies are equally devastating and just as preventable.

You are no doubt aware of the insidious manner in which CO poisoning can cause deaths or serious long-term health problems resulting from the misuse of items like portable generators, or from furnace and gas water heater venting problems or poor maintenance. It is a stealthy, invisible killer, as CO readily replaces oxygen in the bloodstream. Those who survive remain at risk for serious chronic health problems, including brain damage, Parkinson's Disease, and cardiovascular diseases.

The U.S. Consumer Product Safety Commission (CPSC), the lead federal agency charged with protecting consumers from risks of serious injury or death, has identified reducing CO poisonings as a strategic goal. CPSC warns homeowners to install "a CO alarm in the hallway near the bedrooms in each separate sleeping area." Other eminent bodies with expertise in life safety emphatically endorse the use of carbon monoxide detectors, including the U.S. Centers for Disease Control (CDC), and Underwriters Laboratories. According to the CDC, 15,000 Americans seek medical attention or lose at least a day of normal activity every year due to carbon monoxide poisoning.

Additionally, a 2005 American Journal of Emergency Medicine study of 911 calls reported that persons with CO detectors were far less likely to become symptomatic. (13% were symptomatic vs. 64% of those without alarms). The study concluded that "nonfatal carbon monoxide exposures have not decreased and that efforts toward prevention of carbon monoxide poisoning should not be allowed to relax."

The threat from CO poisoning is as diverse as it is widespread. Not all CO poisonings occur among the poor in the northern tier of states in the dead of winter. And not all CO poisonings result only after power outages

continued on 2nd page

from ice storms and hurricanes, although poisonings from misuse of portable generators in confined spaces, even in all-electric homes, represent the fastest growing source. The CPSC just required labeling on portable generators as an interim measure to help educate consumers of this invisible peril.

It is estimated that 25-35 percent of U.S. households today have CO detectors. Alaska, Connecticut, Illinois, Maryland, Massachusetts, Minnesota, New Jersey, New York, Rhode Island, Texas, West Virginia, Utah, and Vermont, as well as Chicago and New York City have enacted CO detector mandates. These initiatives, resulting in growth in home carbon monoxide alarm use since 1994, may be a significant reason for a decline in the CO death rate.

The evidence is compelling. Long-term health costs are significant. CO detectors are cost effective tools readily available right now to protect lives. Thank you for allowing me to express my views on this issue. If the Residential Fire Safety Institute can be of assistance as you move forward with this bill, please do not hesitate to contact me.

Respectfully,

Roy L. Marshall
Director, Residential Fire Safety Institute
rfsirlm@myfmtc.c om 712/829-2734

cc: Steve Biggs & Sandra L. O'Niel

CPSC and USFA News

U.S. Consumer Product Safety Commission
www.cpsc.gov

United States Fire Administration
www.usfa.dhs.gov

FOR IMMEDIATE RELEASE
January 5, 2007
Release # 07-075

CPSC Hotline: (800) 638-2772
CPSC Media Contact: Patty Davis, (301) 504-7908
USFA Media Contact: Tom Olshanski, (301) 447-1853

CPSC and USFA Sound Carbon Monoxide Alarm
As Temperatures Drop, Potential for CO Poisonings and Deaths Rises

WASHINGTON, D.C. - Every year, winter storms leave carbon monoxide (CO) poisoning deaths in their path. As winter's coldest months arrive, with temperatures in some parts of the United States dipping below freezing, the U.S. Consumer Product Safety Commission (CPSC) and U.S. Fire Administration (USFA) are sounding the CO alarm.

"January and February are prime months for winter weather-related power outages," said Acting CPSC Chairman Nancy Nord. "Tragically people are dying from carbon monoxide poisoning while trying to keep warm. Don't let this invisible killer into your home."

"The U.S. Fire Administration is pleased to join with the CPSC in sounding a national carbon monoxide alarm," said Acting U.S. Fire Administrator Charlie Dickinson. "There is no group of men and women in this nation that are as keenly aware of the deadliness of carbon monoxide, than firefighters. During times of lost power, it is our nation's firefighters who respond to the sad results of carbon monoxide poisoning when people use gas generators, camp stoves and charcoal grills in confined spaces. The USFA joins with all firefighters in reminding all residents of this nation to follow the CPSC recommendations below to protect themselves against exposure to carbon monoxide."

Carbon monoxide is an odorless and colorless poisonous gas. CPSC estimates about 140 people die each year from unintentional exposure to carbon monoxide associated with consumer products.

Consumers die when they improperly use gas generators, charcoal grills, and fuel-burning camping heaters and stoves inside their homes or in other enclosed or partially-enclosed spaces during power outages. They also die when furnaces that have not been professionally and annually inspected leak CO. CPSC staff is aware through police, medical examiner and news reports of at least 32 CO deaths related to portable generators from October 1 through December 31, 2006.

Reducing CO poisonings and deaths is a priority at CPSC. Yesterday, in an effort to stop consumers from using gasoline generators indoors, the Commission voted to require manufacturers to place a prominent "danger" label on all new generators and their packaging. CPSC and USFA urge consumers to take these important steps to protect themselves against CO poisoning this winter.

- Never use portable generators inside homes or garages, even if doors and windows are

open. Use generators outside only, far away from the home.

- Never bring a charcoal grill into the house for heating or cooking. Do not barbeque in the garage.
- Never use a gas range or oven for heating.
- Open the fireplace damper before lighting a fire and keep it open until the ashes are cool. An open damper may help prevent build-up of poisonous gases inside the home.
- Have home heating systems (including chimneys and vents) inspected and serviced annually by a trained service technician.
- Install battery-operated CO alarms or CO alarms with battery backup in your home outside separate sleeping areas.
- Know the symptoms of carbon monoxide poisoning: headache, dizziness, weakness, nausea, vomiting, sleepiness, and confusion. If you suspect CO poisoning, get outside to fresh air immediately, and then call 911.

Produced in conjunction with USFA, CPSC has a new television public service announcement (PSA) on CO hazards. To view it requires QuickTime. Two versions are available - a broadcast quality version (about 150 mb) and a small format version (about 20 mb). CPSC also has a radio PSA in mp3 format.

May 4, 2005

UL 2034 Short History - CO Alarms

ANSI/UL 2034 the Standard for Carbon Monoxide Alarms has been one of UL's more active Standards. Initial work on the Standard started in 1989. UL 2034 was originally published in 1992 based on requirements extracted from similar gas and smoke alarm standards and information from the gas appliance, emergency response, and medical communities. The Standard was revised in 1995 to address initial concerns regarding stability of the CO alarms. In 1998 the Standard was revised to address comments from the gas industry and others related to performance and stability of CO alarms.

Changes to UL 2034 with an effective date of October 1, 1998 required CO alarms to exhibit their ability to ignore 30 ppm CO for 30 days and 70 ppm CO for one hour. A new sequence test was added to exhibit the ability of a CO alarm to resist multiple exposures of CO without an appreciable change in the alarm's response. Finally, marking and user instructions direct the user of the product when indicating an alarm to 1)-Operate the silence button, 2)- Call their emergency service organization, and 3)- Move to a location which has fresh air. Repeated activation of the alarm in a 24-hour period requires the same basic three steps plus contacting a qualified technician to trouble shoot the problem.

In an effort to harmonize UL 2034 with CSA/CGA 6.19 and to update UL 2034 additional revisions were adopted in 2001 as follows:

Increased the number of gases in the Selectivity Test, Section 39,

Revised the requirements in the Effect of Shipping and Storage Test, Section 45.2,

Added a new Section 74A to address reliability requirements,

Added Appendix D (Sample Size Determination for Time-of-Manufacture Reliability Testing) for reference only.

UL has completed a survey program to monitor the aging of CO alarms. In March of 1999 UL purchased approximately 70 alarms from retail establishments. Initial sensitivity tests were performed, and the samples distributed to members of the staff to be installed in their homes. Periodically these devices were returned to UL to repeat sensitivity tests. Tests were performed 12 times over a four-year period, and the results were very encouraging. A vast majority of the units performed exactly as required by UL 2034. A few responded a little early, and a few a little late. But all of the devices provided signals that would allow a homeowner to respond to elevated level of CO in the appropriate manor. Two separate devices reported significant CO events, and three other samples indicated supervised trouble signals and were examined by their manufactures.

UL 2034 recently completed ANSI canvas as an American National Standard, and is now designated ANSI/UL 2034. As with any UL Standard the STP committee continues to look at opportunities to make CO alarms more effective.

SUMMARY:

Throughout the first phase of this study, the CO alarms have performed in an effective manor. During the September 2002 tests we recorded our first false positive at 70ppm CO (94 minutes into the test, post 1998 alarm). Also during the September 2002 tests we recorded our first no response sample (pre1998 alarm). During the September 2003 we recorded a significant late response sample (pre1998 alarm). These samples have been returned and analyzed by the manufacturer and/or the UL Field Report Group has opened an investigation. Other samples in the survey of the same, or similar, models are continuing to perform as expected.

On one occasion, a field study CO sample alarmed in an employee's home after their furnace was serviced. It was confirmed that there was a high level of CO present in their home. The problem was corrected and the alarm continues to function properly during follow-up sensitivity tests. On another occasion, a field sample was activated when the damper on a fireplace closed prematurely. The damper was opened, the house vented, and the alarm returned to its normal standby condition.

Throughout the entire survey program we have experienced a few units providing early/delayed signals during the sensitivity tests, but all of these CO alarms would provide effective signaling protection to the users should there be a fatal concentration of CO.

Of the few CO alarms that did not meet the UL2034 test points, most of them alarmed early and it was determined with the Stability Test results that these samples would most likely not false alarm in the field.

It is important to note that providing effective signaling protection does not necessarily mean complying with the finite test points of UL2034. All the alarms would have sounded while a person can react and follow the recommended procedures during an alarm signal.
The data shows that these CO alarms are providing the necessary signaling protection.

The following website has the rest of the study including figures although they are very dense:
http://www.iccsafe.org/cs/cc/ctc/CO/CO_UL_AlarmSurvey.doc

History of UL 2034

- Started in 1989 and published in 1992.
- Revised in 1996:
  - Resist alarm @ 100ppm for 90 min.
  - 200ppm for 35 min.
  - 400ppm for 15 min.
- Revised 1998:
  - 70ppm – alarm between 60 to 240 minutes
  - 150ppm – alarm between 10 to 50 minutes
  - 400ppm – alarm between 4 to 15 minutes
  - Ignore 30ppm or less for at least 30 days
- Revised 2001:
  - Other gases added to Selectivity Test, Section 39
  - Added a new Section 74A to address reliability requirements (could not find the Section online)

Source: http://www.iccsafe.org/cs/cc/ctc/CO/CO_UL2034History.pdf

INTERNATIONAL CODE COUNCIL (ICC)
Code Technology Committee (CTC)

REPORT OF THE CTC
AREA OF STUDY – CARBON MONOXIDE ALARMS

September 22, 2005
Detroit Marriott Renaissance Center
Detroit, MI

The CTC held a public hearing to receive written and verbal comments regarding CTC recommendations for the ICC Board-approved area of study entitled Carbon Monoxide (CO) Alarms. This report includes the final recommendations for this area of study, approved by the CTC upon the conclusion of the public hearing on September 22, 2005. The recommendations contained in this report will be forwarded to the ICC Chief Executive Officer in accordance with ICC Council Policy No. 5.

Scope: As noted in the CTC approved Scope & Objectives Statement, the scope of this activity is:

To study the necessity of requiring the installation of carbon monoxide alarms in residential-type occupancies.

Recommendation: The CTC recommendation is:

There has not been sufficient justification presented to the CTC to mandate carbon monoxide alarms in new or existing residential type occupancies.

In making this recommendation, the CTC notes the importance of and the need for compliance with the applicable code provisions for equipment maintenance and compliance with equipment installation instructions to control the hazards associated with CO emissions.

Considerations: The CTC bases for this recommendation include the following:

- Requiring functional and reliable CO detection in all new and existing dwelling units would potentially reduce fatalities. However, the technical analysis on expected effectiveness and cost impact, as submitted to the CTC, is not adequate to justify a mandate at this time.

- A number of elements impact the effectiveness of a mandate, including breadth of building stock covered, performance of alarms and compliance with use, installation and maintenance instructions.

- The data presented to the CTC indicates that the number of CO related deaths in dwelling units has reduced by about 5% per year, and that only non-fire, unintentional deaths (~ 625 in 1979 decreasing to ~ 325 in 1996) could be avoided by a CO alarm mandate. Insufficient data was presented to assess the potential impact of CO alarms with respect to preventable injuries.

- Laboratory and field data presented to the CTC indicate conflicting performance data of CO alarms across the range of currently listed products.

- Insufficient benefit/cost data has been presented to mandate CO alarms.

- The view of the Environmental Protection Agency, as presented to the CTC, states:

    - "Carbon Monoxide Alarms are widely available in stores and you may want to consider buying one as a back-up --BUT NOT AS A REPLACEMENT for proper use and maintenance of your fuel-burning appliances. However, it is important for you to know that the technology of CO alarms is still developing, that there are several types on the market, and that they are not generally considered to be as reliable as the smoke alarms found in homes today. Some CO alarms have been laboratory-tested, and their performance varied. Some performed well, others failed to alarm even at very high CO levels, and still others alarmed even at very low levels that don't pose any immediate health risk. And unlike a smoke alarm, where you can easily confirm the cause of the alarm, CO is invisible and odorless, so it's harder to tell if an alarm is false or a real emergency." U. S. EPA Fact Sheet, "Protect Your Family and Yourself from Carbon Monoxide Poisoning," http://www.epa.gov/iaq/pubs/coftsht.html.

U.S. CONSUMER PRODUCT SAFETY COMMISSION
WASHINGTON, D.C. 20207

March 28, 2006

Mr. Douglas M. Troutman
Counsel, Government Relations
National Electrical Manufacturers Association
1300 North 17th Street, Suite 1752
Rosslyn, VA 22209

Dear Mr. Troutman:

This letter responds to your February 1, 2006, letter requesting a meeting of U.S. Consumer Product Safety Commission (CPSC) staff and National Electrical Manufacturers Association (NEMA) members to discuss CPSC staff's position on advocating that the model building codes require the installation of carbon monoxide (CO) alarms in all homes. I believe it is appropriate to clarify the CPSC staff's position in writing[1].

CO alarms certified to the current requirements of Underwriters Laboratories (UL) *Standard for Safety for Single and Multiple Station Carbon Monoxide Alarms* (UL 2034) provide a valuable safety service to consumers. CPSC recommends that every home have a CO alarm in the hallway near bedrooms in each sleeping area. CPSC also recommends other measures to ensure the safe operation and proper design, use, maintenance, and installation of combustion appliances.

In June 2004, CPSC staff published results from tests of 40 CO alarms that indicated further improvements to the standard were desirable to improve alarm performance in the field. Staff presented the test results and recommendations to the June 2004 meeting of the UL Standard Technical Panel (STP) on CO alarms. Two issues of particular concern were noted by the CPSC technical staff: 1) The standard does not include a sensitivity test that incorporates a rising CO level to require alarms to activate at or before the CO exposures that would result in a healthy adult having symptoms of CO poisoning, regardless of the concentration profile; and 2) The standard does not require alarms to alert consumers when the alarm's sensor is nearing end-of-life, to ensure that consumers remove unreliable alarms from service.

[1] These comments are those of the CPSC staff, have not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

The CPSC staff is very pleased that the STP immediately acted on our recommendations and that proposals addressing our concerns will be presented to the next STP meeting. Once staff's concerns are satisfactorily addressed, the staff expects to support amendments to the model building codes to require CO alarms in all homes. Until that time, CPSC continues to encourage consumers to purchase and install CO alarms that meet the requirements of the current edition of UL 2034 or the Canadian Standards Association standard *Residential Carbon Monoxide Alarming Devices* (CSA 6.19).

I hope I have sufficiently clarified the CPSC staff's position on requiring CO alarms in the model building codes. If you wish, the CPSC staff would be happy to meet with NEMA members to further discuss this issue. If you have any questions, please call me at 301-504-7534.

Sincerely,

Donald W. Switzer
Directorate for Engineering Sciences

cc: Ted Williams AGA
Brandon Tutor GAMA

September 26, 2007 08:30 AM Eastern Daylight Time

Building Codes Drive Growth of U.S. Carbon Monoxide Detectors

PALO ALTO, Calif.--(BUSINESS WIRE)--New housing and building codes are being implemented and adopted in certain states of the U.S. and are set to drive significant growth of the carbon monoxide (CO) detectors market. As this trend increases in more states, CO detectors will become virtually ubiquitous in residential and commercial buildings as smoke detectors did in the 1990s.

New analysis from *Frost & Sullivan* (http://www.buildingtechnologies.frost.com), **U.S. Carbon Monoxide Detectors Market**, finds that this market earned revenues of $352.9 million in 2006 and estimates this to reach $537.8 million in 2010.

If you are interested in a virtual brochure, which provides manufacturers, end users, and other industry participants with an overview of the latest analysis of **U.S. Carbon Monoxide Detectors Market**, then send an e-mail to Johanna Haynes, Corporate Communications, at johanna.haynes@frost.com with the following information: your full name, company name, title, telephone number, e-mail address, city, state, and country. We will send you the information via e-mail upon receipt of the above information.

"New housing and building codes require that every building occupied wholly or partially for residential purposes have appropriate CO alarms in place," notes *Frost & Sullivan* Research Analyst Jorge Moreno. "Commercial buildings are also required to install CO alarms, as stipulated by the National Fire Protection Association (NFPA), while the Recreational Vehicle Industry Association (RVIA) requires all new recreational vehicles (RVs) to have CO detectors at the time of sale."

Security systems increasingly implement CO detectors to offer families enhanced protection from various threats such as thefts and fires. This will allow security system companies to offer integrated solutions and more value to potential customers.

Simultaneously, the trend toward integration of CO detectors with security systems and other detection systems such as fire alarms leads to increased acquisitions and mergers among companies. Larger companies benefit by this trend as it enhances their product portfolios and strengthens distribution channels, thereby expanding market penetration.

"Combining resources also allows manufacturers to achieve better economies of scale and compete more effectively by being able to offer lower prices," says Moreno. "On the other hand, smaller companies will have to either partner with or serve well-established manufacturers that have a strong distribution network, while technologically innovative companies stand a chance of being acquired by larger companies."

A key challenge faced in the CO detectors market is demand for these products that is largely dictated by the enforcement of building codes. Under compulsion to install detectors to comply with these codes, consumers

may choose a product based on price rather than its suitability for the end application.

End users have a tendency to install only the essentials for individual projects instead of a complete line of products. For instance, if a code requires three devices in one room but installing five is more effective, consumers treating the building codes as the maximum requirement for safety will likely opt for installing only three devices. This can cause the manufacturer to lose out on sales of two additional detectors.

The cost factor expects to drive the demand for battery-operated CO detectors over competing product types due to lower prices. Consumers' inclination to buy the most cost-effective product that adequately meets the building code specifications favors the battery-operated segment.

U.S. Carbon Monoxide Detectors Market, part of the **Building Management Technologies** Growth Partnership Service, provides revenue and unit shipment forecasts, market share analysis and a breakdown of competitive structure by market. *Frost & Sullivan's* expert analysts thoroughly examine the following end-user markets: residential, commercial and recreational. Interviews with the press are available.

Frost & Sullivan, a global growth consulting company, has been partnering with clients to support the development of innovative strategies for more than 40 years. The company's industry expertise integrates growth consulting, growth partnership services, and corporate management training to identify and develop opportunities. *Frost & Sullivan* serves an extensive clientele that includes Global 1000 companies, emerging companies, and the investment community by providing comprehensive industry coverage that reflects a unique global perspective, and combines ongoing analysis of markets, technologies, econometrics, and demographics. For more information, visit http://www.frost.com.

U.S. Carbon Monoxide Detectors Market

N1F5

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The major changes in ICD-10 is a return to grouping of deaths specifically attributed to CO into the broader classification of gases and vapors and the elimination of identification of the source of CO attributed to the recorded death.

In ICD-10, there are only three categories associated with unintentional non-fire CO deaths. Theses are:

X47 Accidental poisoning by and exposure to other gases and vapors
X67 Intentional self-poisoning (suicide) by and exposure to other gases and vapors
Y17 Poisoning by and exposure to other gases and vapors, undetermined intent

These three classifications include not only CO deaths but deaths due other gases as well. Our methodology, which will be discussed in our future report, includes a step to extract only CO deaths. Table 1 shows the number of reported unintentional non-fire carbon monoxide deaths both the total US and Michigan, for 1979-2004.

Table 1 Unintentional Non-fire CO Deaths. 1999-2004

Year	National	Michigan	MI Home Deaths
1979	1291	70	45
1980	1071	54	36
1981	1134	61	37
1982	1116	70	54
1983	1079	53	31
1984	915	54	41
1985	931	46	31
1986	851	56	41
1987	743	41	25
1988	727	38	25
1989	760	40	21
1990	620	25	13
1991	619	36	18
1992	527	27	17
1993	549	22	15
1994	582	21	12
1995	533	22	15
1996	531	32	27
1997	474	24	19
1998	460	15	8
1999	396	26	16
2000	441	14	8
2001	398	11	8
2002	320	26	21
2003	451	22	17
2004	420	17	12

Unintentional Non Fire Carbon Monoxide Poisoning Deaths

1999- 2004 Interim Report

Irwin Billick
WEC Consulting
November 7, 2007

This report is a preliminary update of accidental carbon monoxide poisoning death for the period 1999-2004. The data for this report comes from the US National Center for Heath Statistics (NCHS) Multiple Cause-of-Death Public Use data files. The data in these files are coded according to the current version of the International Classification of Diseases) guidelines, ICD-10, that went into effect in 1999.

The protocol for reporting death from diseases and injuries is covered by the *International Classification of Diseases (ICD)* and the details of the reporting has been revised periodically about every 10-20 years since 1900. The purpose of the revision is to stay abreast of medical advances in terms of disease nomenclature and etiology. The introduction of new classifications often introduces major disruptions in time series of mortality and morbidity statistics. However, revisions are essential to stay current with advances in medical science and to ensure the international comparability of health statistics. The previous version of the ICD, ICD-9, was used extensively in our earlier detailed analyses of CO deaths, covered the period from 1979-1998. The change from ICD-9 to ICD-10 differs significantly in several respects.

According to NCHS, ICD-10 is far more detailed than ICD-9, with about 8,000 categories compared with about 5,000 categories. ICD–10 uses alphanumeric codes compared with numeric codes in ICD–9; some additions and modifications were made to the chapters in the ICD; and some of the coding rules and rules for selecting the underlying cause of death have been changed. As a result, there may be observable or apparent discontinuities in cause-of-death statistics resulting from these classification and rule changes that are critical to the interpretation of mortality trends.

For analysis of CO poisoning deaths, the classification and rule changes have resulted in the elimination of the specificity of classification categories related CO poisoning that has been extremely important in the analysis of characteristics and temporal trend of unintentional CO deaths and injury data. Under ICD 10, there are only three injury codes applicable to CO:

Data on the total number of deaths in the United States specifically attributable to unintentional poisoning due to solids and liquids are available as far back as 1913. Comparable data for unintentional poisoning due to vapors and gases, which included CO started in 1923. The reporting of unintentional or accidental deaths specifically attributed to CO and classification (ICD E-codes) according to a specific CO source began in 1939. The differences between the various versions of the ICD guidelines, as it effects the CO death analyses will be discussed in a separate report.

Figure 1 shows the historic trends of deaths due to gases and vapors and CO specifically for the years for which data are available.

Deaths due to CO rose between 1939, when CO was specifically specified that reached an all time maximum in 1945. The subsequent decline in CO deaths continued for about 10 years and then rose again for about 20 years, due to CO deaths from CO from motor vehicle emissions, reaching a peak in 1975. CO deaths have trended to decrease from the 1975 peak until 2004.

In-depth analysis of the historic trends of CO deaths will be treated in a separated report. The remainder of this report will focus on the post 1998 period covered by ICD-10.

Figure 2 is a regression analysis of shows the total number of unintentional non-fire CO deaths from all sources reported between 1979 and 2004, for the entire county. The regression analysis used an exponentional model and trend line shows the predicted number of deaths out to 2015. The correlation coefficient is very high, $R^2 = 0.94$. The analysis also shows that the decline of CO deaths over this time period is 4.9% annually. There is no statistical indication that CO alarms had any impact on the decline of CO deaths during this period.

Figure 1. Accidental Deaths Due to Gases and Vapors 1920-2010

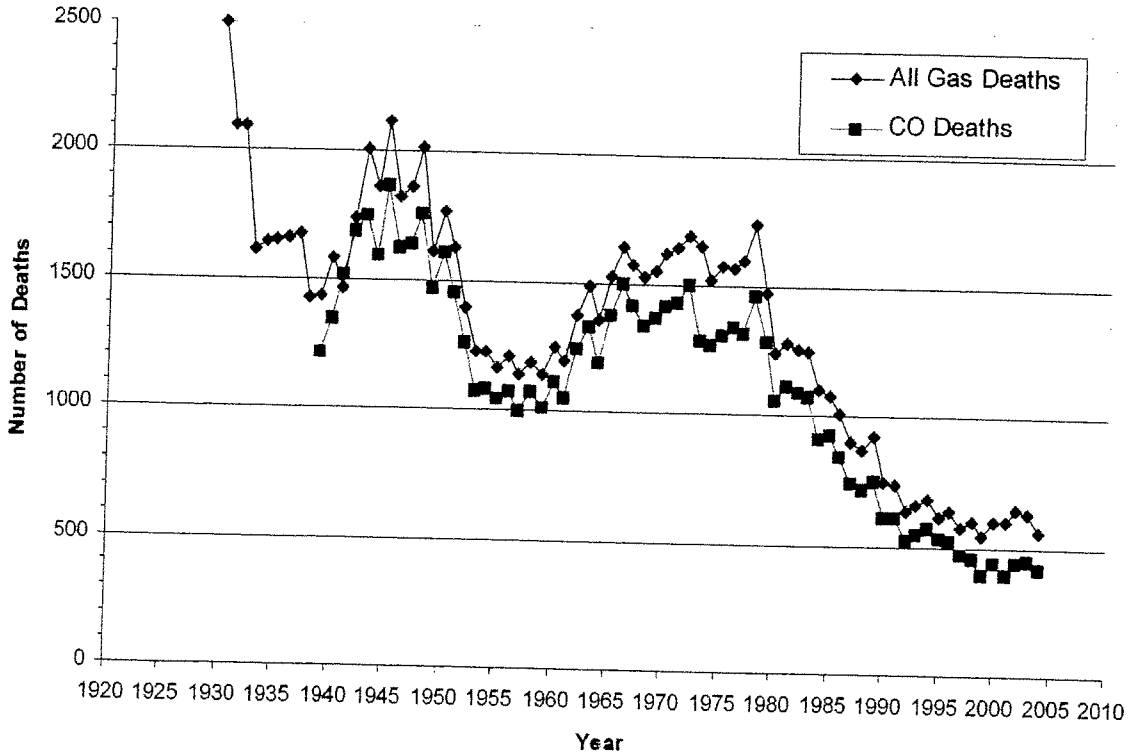


Figure 2. Unintentional Non Fire Carbon Monoxide Deaths
Total US 1979-2004
Data From US Center for Disease Control National Center for Health Statistics

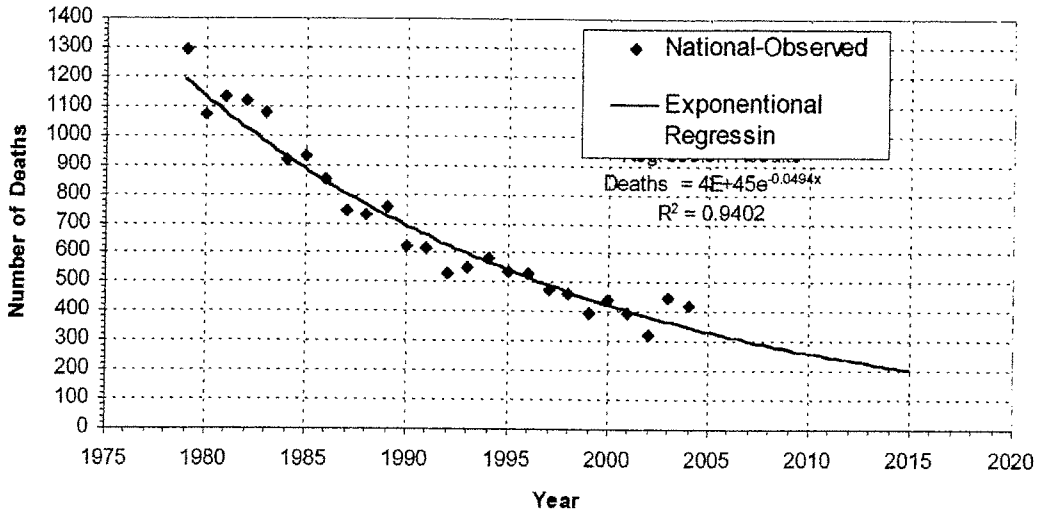


Figure 3 shows a similar analysis for the Michigan state. The correlation coefficient is somewhat lower as would be expected since there is less data. The decline in CO deaths is slightly higher, 6.0% per year.

A direct comparison of the time trend of the Michigan and National CO deaths can be seen in Figure 4 where the data is plotted as the natural logarithm of the number of deaths.

Table 1 also includes the number of CO deaths in Michigan reported as taking place in the home for the 1979-2004 period. Figure 5 compares the deaths in the home to the total for the state. The average ratio for deaths in the home for the 1979-2004 period is 0.66.

Figure 3. Unintentional Non Fire Carbon Monoxide Deaths
Michigan 1979-2004
Data From US Center for Disease Control National Center for Health Statistics

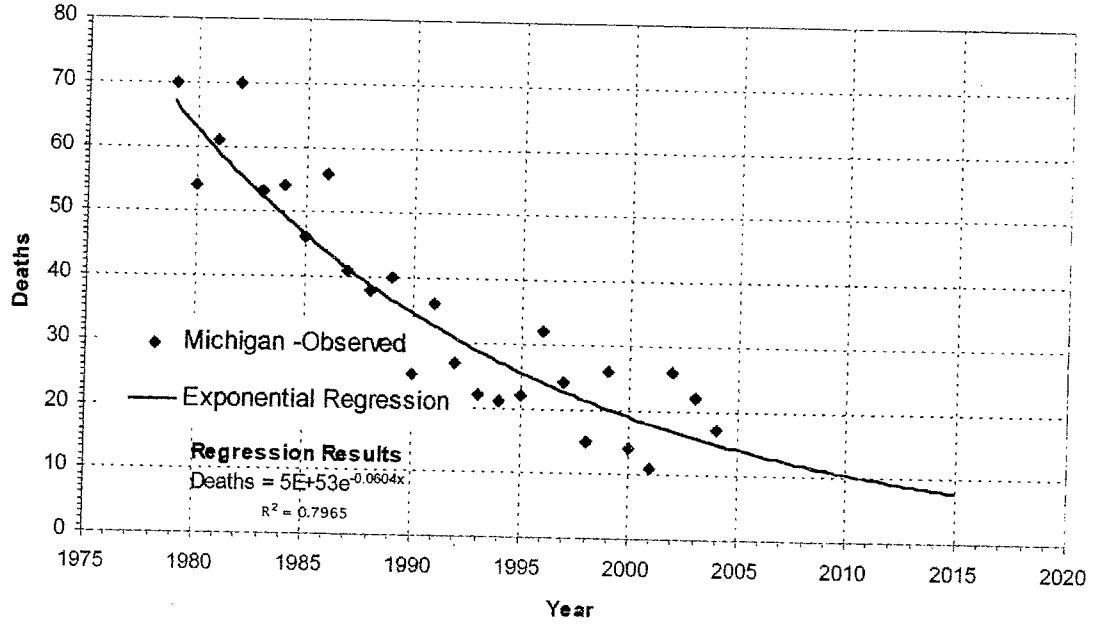


Figure 4. Comparison of Michigan and Total US
Unintentional Non Fire Carbon Monoxide Deaths 1979-2004

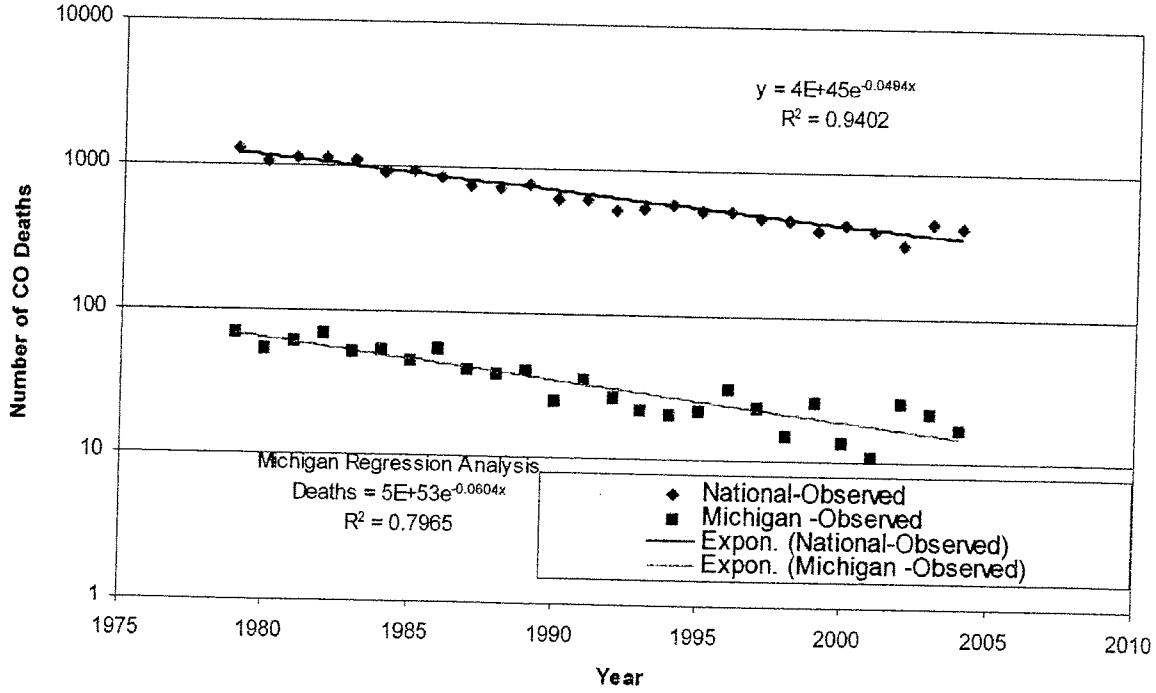
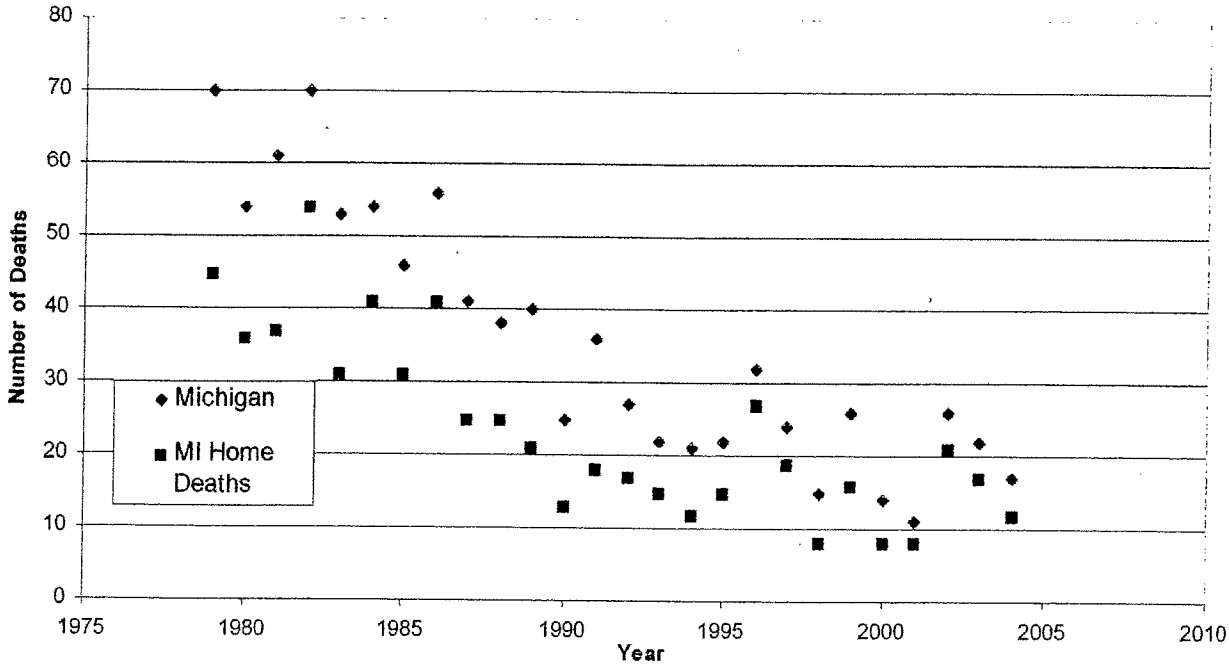
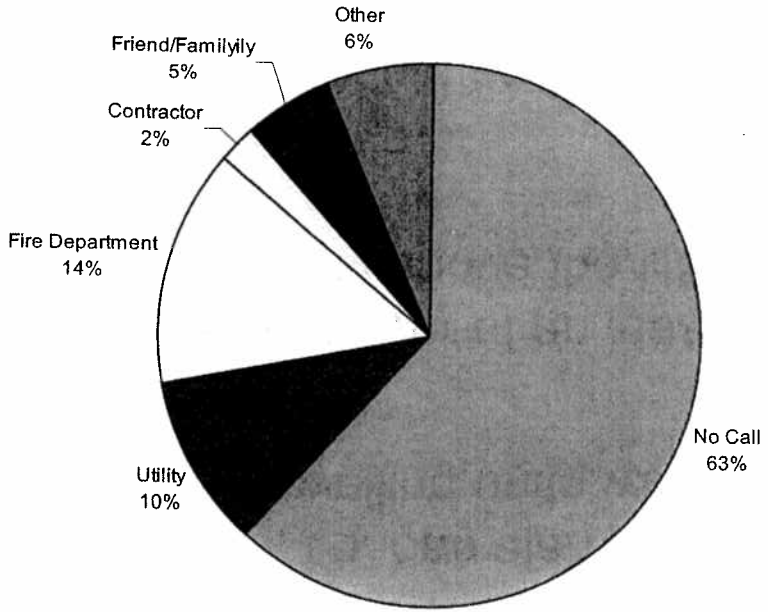


Figure 5. Unintentional Non Fire Carbon Monoxide Deaths Occurring in the Home in Michigan 1979-2004



Failure of Consumer to Respond Appropriately to an Alarm Will Reduce Effectiveness

Consumer Response to CO Alarm *



***RESIDENTIAL CARBON MONOXIDE ALARM POPULATION: SIX CITIES STUDY**

J. Kramer and S. Tikalsky GRI-00/0144 August 2000

Summary (continued)

- For the ideal mandate, i.e. one alarm in every house, about two CO deaths per million dwelling units would be avoided.

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- The total cost to the tax payer of an ideal mandate, i.e. one alarm in every house, is probably above the US Government life value of $ 6 million dollars.

- The efficiency of the mandate and costs of degraded by impacts such as:
  - Limitations on population covered
  - Compliance with the mandate
  - Performance and reliability of alarms
  - Consumer action in response to an alarm

Summary

- Most, if not all, mandates have not carried out any technical analysis on expected effectiveness or cost.

- A number of elements impact mandate effectiveness.

- Total number of accidental CO deaths, from all sources, has decreased from ~ 6000 in 1979 to ~ 3700 in 1996.

- Of these only those from non-fire unintentional deaths (~ 625 in 1979 and ~ 325 in 1996) would be avoided by a mandate requiring an alarm in all dwelling units.

- The number of deaths/dwelling unit has been dropping by about 6% per year.

Efficacy of Mandating CO Alarms as Public Health Policy

Irwin H. Billick, Ph.D.
WEC Consulting
Potomac, MD

Presented at ASHRAE Seminar

Mandating CO Alarms: Is It in The Public's Interest?

January 28, 2001
Atlanta, Ga.

424 Carbon monoxide incident. Excludes incidents with nothing found. Excludes codes 736 and 746 System or detector malfunction. Includes improper performance of an alarm system that is not a result of a proper system response to environmental stimuli such as smoke or high heat conditions.

736 Carbon monoxide detector activation due to malfunction. Unintentional system or detector operation.Includes tripping an interior device accidentally.

746 Carbon monoxide detector activation (no carbon monoxide detected). Excludes carbon monoxide detector malfunction (736).

Detector.

Definition.

The presence in the general area of fire or other incident of one or more detectors that was within the operational range of the detector(s) at the time of an incident.

Purpose.

The information on whether or not a detector alerted the occupants of a structure to an emergency is important for understanding fire control and life safety with and without detection equipment.

The coding indicates if a detector alerted the occupants in this incident (regardless of whether the detector was smoke, heat, carbon monoxide, etc.). The code is left blank for non-fire incidents, and can optionally[4] be used for a carbon monoxide) incident and whether a CO detector operated. The specific codes used in this analysis are:

Blank	Not entered
1	Detector alerted occupants
2	Detector did not alert occupants.
U	Unknown.

[4] The optional nature of completing this field is a major limitation on the analysis of the data.

Since these studies were conducted there have been a number of changes in CO alarm technology, UL standards for CO alarms, and the number and distribution of CO alarms in residences. In addition, fire departments have become the principal first responders to emergency calls related to actual or presumed exposure to elevated carbon monoxide gas. This report is an examination of data collected by U.S. fire departments in response to CO calls between 1999 and 2004.

Data Source.

The U.S. Fire Administration (USFA), a component of the Department of Homeland Security, developed the National Fire Incident Reporting System (NFIRS) as a means of assessing the nature and scope of the fire (and some non-fire) problems in the United States. NFIRS version 5.0 NFIRS 5.0 is a modular, all-incident reporting system designed by the U.S. Fire Administration, with input from the fire service and other users of the data[3]. The data include information specifically related to carbon monoxide incidents and the role of carbon monoxide alarms, as well as, general data related to the fire departments' action.

After responding to an incident, fire department personnel complete one or more of the NFIRS "modules." The information in these modules describes the type of incident, where it occurred, the resources used to mitigate it and other information designed specifically to understand the nature and causes of fire, hazardous material (HazMat), and emergency medical service (EMS) incidents and other emergencies.

Information is also collected on the number of civilian or firefighter casualties and an estimate of property loss. The uniformity of definitions used in coding NFIRS fields makes aggregation of national data possible. Information is entered about an emergency response either manually on a form or directly through a computer. Local agencies forward the completed NFIRS modules to the state agency responsible for NFIRS data. The state agency combines the information with data from other fire departments into a statewide database and then transmits the data to the National Fire Data Center (NFDC) at the U.S. Fire Administration. The NFDC can then compare and contrast statistics from states and large metropolitan departments to develop national public education campaigns, make recommendations for national codes and standards, guide allocation of federal funds, determine consumer product failures, identify the focus for research efforts, and support federal legislation. NFIRS is the primary source of data for a wide range of analyses and reports.

In Version 5.0, which was implemented in 1999, a series of descriptions with assigned code numbers is used to describe incidents. Many of these descriptive phrases were created by the National Fire Protection Association (NFPA) and published in NFPA 901, Standard Classifications for Incident Reporting and Fire Protection Data, 1995, 2001 editions. Appropriate codes and other details of the data system are included in the National Fire Incident Reporting System 5.0 Complete Reference Guide that may be downloaded from the above web site.

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[3] http://www.usfa.fema.gov/nfirs/

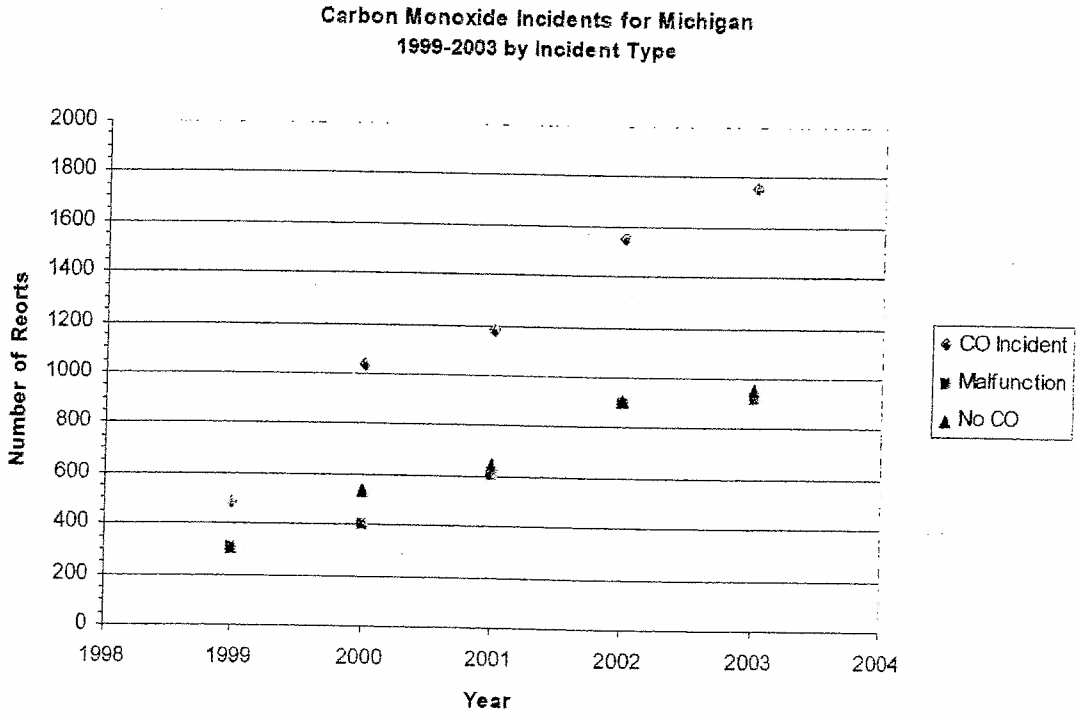
Results for Michigan

Incident Type

Usable data are available for 1999-2003. The data in Table 1 shows the number of calls by year for Michigan. The data show the number of fire department reports for 1999-2003 reports by the three CO incident types; CO Incident, CO detector malfunction and CO detector, no CO present Less than half, 47.8% of the incidents were possibly associated with the presence or effects of carbon monoxide. The remaining 52.2% are reported as being the result of alarm malfunction or no measurable CO present.

Year	CO Incident	Malfunction	No CO	Total	Incident/Total	Malfunction/Total	NoCO/Total
1999	488	318	312	1118	0.436	0.284	0.279
2000	1036	409	544	1989	0.521	0.206	0.274
2001	1178	611	654	2443	0.482	0.250	0.268
2002	1548	905	915	3368	0.460	0.269	0.272
2003	1754	932	959	3645	0.481	0.256	0.263

The trends of the three incident types are shown below. The trends for the three types are similar to the national trends and almost parallel to each other.



Given additional time additional analysis of the data can provide insight to the nature of the calls, such as type of structure and type of assistance provided by the responder.

code should be required to adhere to the limitations of the code. Applying limitations to guards that are not required is equivalent to enforcing a law in a jurisdiction where the law does not apply. The additional limitations may also discourage the inclusion of guards deemed necessary in special situations, but not required by the code. If no negative comments are received, then NOMMA withdraws this comment.

Final Action: AS AM AMPC____ D

RB109-06/07

R313, R313.1.1 (New), Chapter 43

Proposed Change as Submitted:

Proponent: Roger R. Evans, Park City Municipal Corporation, Utah, representing Utah Chapter of ICC

1. Revise as follows:

SECTION R313
SMOKE ALARMS

2. Add new text as follows:

R313.1.1 **Carbon monoxide alarms.** Carbon monoxide alarms shall be installed on each habitable level of a dwelling unit equipped with fuel burning appliances. All carbon monoxide detectors shall be listed and comply with UL 2034 and shall be installed in accordance with provisions of this code and NFPA 720. Approved combination smoke and carbon monoxide detectors shall be permitted.

3. Add standard to Chapter 43as follows:

UL		
	2034–96	Standard for Single and Multiple Station Carbon Monoxide Alarms
NFPA		
	720-05	Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units

Reason: According to the Journal of the American Medical Association (JAMA), carbon monoxide is the leading cause of accidental poisoning deaths in America. 1,500 people die annually due to accidental carbon monoxide exposure and additional 10,000 seek medical attention. (Medical experts agree that it's difficult to estimate the total number of carbon monoxide incidents because the symptoms of carbon monoxide poisoning resemble so many other common ailments.) www homesafe.com

Cost Impact: The code change proposal will increase the cost of construction between $50.00 to $200.00 per residential unit

Analysis: Results of the review of the proposed standard(s) will be posted on the ICC website by August 20, 2006

Note: The following analysis was not in the Code Change Proposal book but was published in the "Errata to the 2006/2007 Proposed Changes to the International Codes and Analysis of Proposed Reference Standards" provided at the code development hearings:

Analysis: Review of proposed new standard indicated that in the opinion of ICC Staff, the standard did comply with ICC standards criteria

Committee Action: **Disapproved**

Committee Reason: The committee disapproved this change after considerable negative testimony. There is no clear direction given for placement of these devices. The CO detectors are prone to false alarm indications. The Department of Homeland Security representative stated that 94 percent of the time these detectors activated it was due to a malfunction of the device. The committee also voiced concern over tying these devices in with the presence of fuel burning appliances

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

[illegible] Park City Municipal Corporation, representing Utah Chapter of ICC, requests Approval

313.1.1 Carbon monoxide alarms. ~~Carbon monoxide alarms shall be installed on each habitable level of a dwelling unit equipped with fuel-burning appliances. All carbon monoxide detectors shall be listed and comply with UL 2034 and shall be installed in accordance with provisions of this code and NFPA 720. Approved combination smoke and carbon monoxide detectors shall be permitted.~~ In new construction, dwelling units within which fuel-fired appliances are installed shall be provided with an approved carbon monoxide alarm installed outside of each separate sleeping area in the immediate vicinity of the bedroom(s).

313.1.2 Where required-existing dwellings. In existing dwellings, where interior alterations, repairs, fuel-fired appliance replacements or additions requiring a permit occur, or where one or more sleeping rooms are added or created, carbon monoxide alarms shall be provided in accordance with Section 313.1.1.

313.1.3 Alarm requirements. The required carbon monoxide alarms shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed. Carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.

UL

2034–96 Standard for Single and Multiple Station Carbon Monoxide Alarms

NFPA

~~720-05 Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units~~

Commenter's Reason: This modification is consistent with the assembly action taken on **M41-06/07 Part I, II and III.** According to the Journal of the American Medical Association (JAMA), carbon monoxide is the leading cause of accidental poisoning deaths in America. 1,500 people die annually due to accidental carbon monoxide exposure and additional 10,000 seek medical attention (Medical experts agree that it's difficult to estimate the total number of carbon monoxide incidents because the systems of carbon monoxide poisoning resemble so many other common ailments.) www.homesafe.com

Public Comment 2:

David C. Delaquila, Gas Appliance Manufacturing Association (GAMA), requests Disapproval.

Commenter's Reason: GAMA believes this proposal should be disapproved on the basis that it unfairly identifies fuel-burning appliances as the only source of carbon monoxide. Carbon monoxide alarms should be installed in all residential occupancies, regardless of the type of fuel the appliances use. The recent rash of CO incidents in Washington State (predominantly electric heat pumps) and Texas during power outages as a result of inclement weather reinforces the need for theses devices to be installed in all residential buildings. A large majority of the recent CO incidents was attributed to the misuse of power generators. Had these homes had a working CO alarm with battery power backup many of these incidents might have been avoided. Carbon monoxide comes from a variety of sources unrelated to fuel-burning appliances and this proposal does not go nearly far enough to provide safety to all occupancies. Code requirements that address life safety should not fall short of its goal.

Public Comment 3

Ted A. Williams, American Gas Association, requests Disapproval.

Commenter's Reason: ICC should disapprove this proposal. The ICC Code Technology Committee has published on the ICC website its recommendation from its Area of Study - Carbon Monoxide Alarms. Its recommendation is as follows:

> "Recommendation. The CTC recommendation is:
>
> There has not been sufficient justification presented to the CTC to mandate carbon monoxide alarms in new and existing residential type occupancies.
>
> In making this recommendation, the CTC notes the importance of and the need for compliance with the applicable code provisions for equipment maintenance and compliance with equipment installation instructions to control the hazards associated with CO emissions."[1]

This recommendation follows many hours of testimony and presentation of documentation (recorded on the ICC website) on CO alarm issues from a wide variety of stakeholders at CTC meetings in Schiller Park, IL and Detroit, MI. ICC committees should address this recommendation in its deliberations and explain alternative actions to the CTC recommendation.

In addition, the following issues of the ICC proposals support disapproval:

- The U. S. Consumer Product Safety Commission (CPSC), in response to separate letter from the NEMA and Gas Appliance Manufacturers Association (GAMA) requesting CPSC support of CO alarm mandates, has stated that it would not support CO alarm mandates until issues of long term reliability of CO alarms were addressed.
- Issues of alarm reliability have not been addressed in published information on alarm performance. As a result, information to date demonstrates poor performance in the field (including data from first responders documented in the National Fire Investigation Response Data System – NFIRS) and in controlled laboratory tests for mitigating false positive and FALSE NEGATIVE activation. The information provided to the CTC and in the public record documents this information in detail.[2]

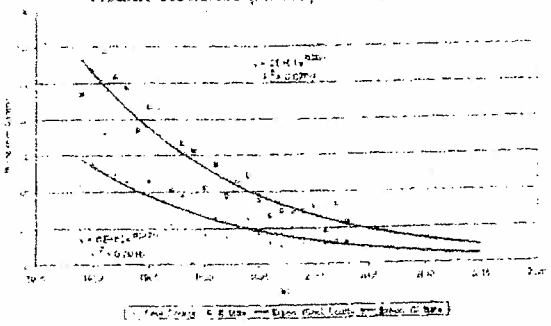
- The CO alarm proposal is in conflict with NFPA 720, the ANSI-recognized consensus standard for installation and location of CO alarms. In the case of RB109, specifically, occupancies with attached garages are excluded, whereas under NFPA 720, these occupancies are included. Other conflicts with NFPA 720 exist as well.
- RB109, through its conflicts with NFPA 720 and focus on new and renovated housing, would not have a demonstrable impact on CO fatalities nationally. Even with 100% COMPLIANCE, PERFECT ALARM RELIABILITY, and PERFECT CONSUMER RESPONSE, these proposals might address only about 20% of CO fatalities since current national residential poisoning incidents involve automobiles in attached garages and older housing without renovation or appliance replacement.

- This proposal does not address THE ONLY GROWING CAUSE OF CO FATALITIES -- PORTABLE EQUIPMENT, INCLUDING GENERATORS.
- CO alarms are not currently a stable product since UL through its Standards Technical Panel 2034 is addressing fundamental issues of alarm life and even activation points. At its upcoming meeting in October, UL will consider proposals to the UL 2034 standard to address deficiencies documented by CPSC and others. The changes proposed would fundamentally alter the design and performance of CO alarms.
- Experience from the City of Chicago, the first major metropolitan jurisdiction in the U. S. to promulgate mandatory CO alarm installation requirements, illustrates in the plot of CO fatalities below THE INEFFECTIVENESS OF MANDATES:

  - Though promulgated in 1994, Chicago and its collar communities in Cook County (many of which have similar mandates) continue to have CO fatalities. Continuing frequency of CO fatalities around ten per year appears to be stable over time and may be expected to continue in the future.
  - The annual number of deaths in this community is consistent with historical trends of declining CO fatalities over time, but no impact or change in this rate of decline can be attributed to the Chicago mandate.
  - For the mandate to have been effective, either CO fatalities would have had to decrease to zero or near zero, or at a minimum, the rate of CO fatalities would have had to show a discontinuous change that could be associated with the promulgation of the mandate.
  - Reasons for the ineffectiveness of the Chicago mandate are the subject of speculation and may be attributed to lack of compliance, lack of enforcement, lack of appropriate response, failure of alarms to perform as designed, or these and other factors in combination and discussed in AGA's presentation to the CTC[1]. Nevertheless, the societal cost of the mandate has been significant with no discernable societal benefit

Cook County and Illinois CO Deaths

Regression Analysis of National Center for Health Statistics (NCHS) Data 1979-2003



"Report of the CTC Area of Study – Carbon Monoxide Alarms," International Code Council Code Technology Committee, September 22, 2005, Detroit Marriott Renaissance Center, Detroit, Michigan [Available on the ICC website: http://www.iccsafe.org/cs/cc/ctc/Carbon.html].

Williams, Ted A. "CO Alarm Mandates in Model Codes as Public Policy," presented at ICC Code Technology Committee on CO Alarms, July 26, 2005, Schiller Park, Illinois [Available on the ICC website: http://www.iccsafe.org/cs/cc/ctc/Carbon.html].

Williams, Ted A. "CO Alarm Mandates in Model Codes as Public Policy," presented at ICC Code Technology Committee on CO Alarms, July 26, 2005, Schiller Park, Illinois [Available on the ICC website: http://www.iccsafe.org/cs/cc/ctc/Carbon.html]

Final Action: AS AM AMPC____ D

B110-06/07
313, R313.2 (New), R313.3

roposed Change as Submitted:

roponent: Frank Stanonik, Gas Manufacturers Association (GAMA)

Revise as follows:

SECTION R313
SMOKE ALARMS AND CARBON MONOXIDE ALARMS

:. Add new text as follows:

R313.2 Single- or multiple-station carbon monoxide alarms. Single- or multiple-station carbon alarms shall be installed in the following locations:

1. Outside of each separate sleeping area within 10 feet of any bedroom door.
2. On each additional story of the dwelling, including basements, but not including crawl spaces and uninhabitable attics.

Carbon monoxide alarms shall be listed and labeled as complying with ANSI/UL 2034, *Standard for Single and Multiple Station CO Alarms*, or CSA 6.19, *Residential Carbon Monoxide Detectors*, and shall be installed in accordance with the manufacturer's installation instructions and NFPA 720, *Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units*. Listed combination smoke and carbon monoxide alarms shall be acceptable.

(Renumber subsequent sections)

3. Revise as follows:

R313.3 Power source. In new construction, the required smoke alarms shall receive their primary power from the building wiring when such wiring is served from a commercial source, and when primary power is interrupted, shall receive power from a battery. Wiring shall be permanent and without a disconnecting switch other than those required for overcurrent protection. Smoke and carbon monoxide alarms shall be permitted to be battery operated when installed in buildings without commercial power or in buildings that undergo alterations, repairs or additions regulated by Section R313.2.1.

4. Add standards to Chapter 43 as follows:

UL
2034-96 Standard for Single and Multiple Station Carbon Monoxide Alarms

NFPA
720-05 Standard for the Installation of Carbon Monoxide (CO) Warning Equipment in Dwelling Units

Reason: The proposed addition to the code would require the installation of carbon monoxide (CO) alarms in dwellings regulated under the International Residential Code. CO is a colorless, odorless gas that is a product of incomplete combustion of fuels such as oil, natural gas, kerosene, gasoline, and wood. High concentrations of CO present a health hazard. Due to the nature of CO, it is only detectible with CO sensing instruments.

The Consumer Product Safety Commission (CPSC) estimates that in 2002 there were 188 CO poisoning deaths associated with the use of a consumer product. It is important to note that the CPSC estimate only includes residential use of consumer products; therefore, fatalities resulting from exposure to CO from an automobile are not included, even in the case of an attached garage.

The proposal applies to all homes because there are a variety of sources of CO, some that are portable, which may cause elevated CO concentrations in a home. For instance, the CPSC estimates that 54% of annual CO fatalities are due to heating systems, while the remaining 46% are attributable to other items such as portable generators, camp stoves, or charcoal grills. Many states and local jurisdictions have already adopted legislation requiring the installation of CO alarms in homes, most recently in Massachusetts.

The proposed code requires carbon monoxide alarms to be listed as ANSI/UL 2034 or CSA 6.19 compliant. These performance standards for CO alarms provide assurance that the product meets specific performance standards. Many questions have been raised as to the reliability, performance, and length of life of a CO alarm. A study published by Mosaic Industries in 2003 titled "Evaluating the Performance of Residential CO Alarms" raises such questions. It is important to note that while the report was published in 2003, all of the alarms tested were manufactured prior to the year 2000. There have been many revisions to the product standards since that time. In an effort to harmonize ANSI/UL 2034 with CSA 6.19 and to update ANSI/UL 2034, revisions have been to increase the number of gases in the Selectivity Test, modify the requirements in the Effect of Shipping and Storage Test, add a new Section 74A to address reliability requirements, and a low humidity test requirement. These product standards continue to improve and have already addressed many of the performance concerns that have raised concern during past CO alarm code proposals.

Bibliography: "Non-Fire Carbon Monoxide Deaths Associated with the Use of Consumer Products, 2002 Annual Estimates," Consumer Product Safety Commission

Cost Impact: The code change proposal will increase the cost of construction The average retail price of a carbon monoxide alarm is $30.

Analysis: Results of the review of the proposed standard(s) will be posted on the ICC website by August 20, 2006.

Note: The following analysis was not in the Code Change Proposal book but was published in the "Errata to the 2006/2007 Proposed Changes to the International Codes and Analysis of Proposed Reference Standards" provided at the code development hearings:

Analysis: Review of proposed new standard indicated that, in the opinion of ICC Staff, the standard did comply with ICC standards criteria.

Committee Action: **Disapproved**

Committee Reason: The committee disapproved this proposed change to be consistent with the actions taken on RB109-06/07

Assembly Action: **None**

Individual Consideration Agenda

This item is on the agenda for individual consideration because public comments were submitted.

Public Comment 1:

David C. Delaquila, Gas Appliance Manufacturing Association (GAMA), requests Approval as Submitted.

Commenter's Reason: GAMA believes that carbon monoxide alarms should be installed in all residential occupancies. The recent rash of CO incidents in Washington State and Texas during power outages as a result of inclement weather reinforces the need for theses devices in all residential buildings. A large majority of the recent CO incidents was attributed to the misuse of power generators. Many of these incidents might have been avoided had occupants had a working CO alarm with battery power backup

Public Comment 2:

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Commenter's Reason: : ICC should disapprove this proposal The ICC Code Technology Committee has published on the ICC website its recommendation from its Area of Study Carbon Monoxide Alarms Its recommendation is as follows:

> "Recommendation: The CTC recommendation is:
>
> There has not been sufficient justification presented to the CTC to mandate carbon monoxide alarms in new and existing residential type occupancies.
>
> In making this recommendation, the CTC notes the importance of and the need for compliance with the applicable code provisions for equipment maintenance and compliance with equipment installation instructions to control the hazards associated with CO emissions."[1]

This recommendation follows many hours of testimony and presentation of documentation (recorded on the ICC website) on CO alarm issues from a wide variety of stakeholders at CTC meetings in Schiller Park, IL and Detroit MI. ICC committees should address this recommendation in its deliberations and explain alternative actions to the CTC recommendation

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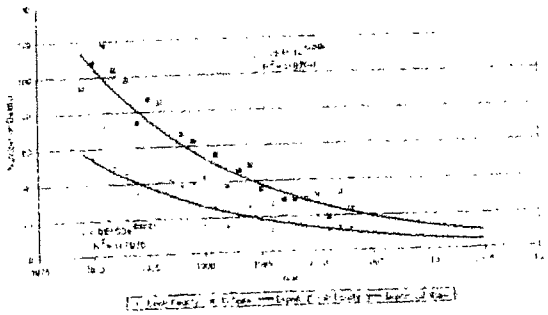

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Williams. Ted A. "CO Alarm Mandates in Model Codes as Public Policy," presented at ICC Code Technology Committee on CO Alarms, July 26, 2005, Schiller Park, Illinois [Available on the ICC website: http://www.iccsafe.org/cs/cc/ctc/Carbon.html].

Final Action: AS AM AMPC____ D

RB114-06/07

R313.3 (New)

Proposed Change as Submitted:

Proponent: John Dean, National Association of State Fire Marshals

Add new text as follows:

R313.1 Fire protection systems. An approved automatic fire sprinkler system shall be installed in new one- and two-family dwellings and townhouses in accordance with Section 903.3.1 of the *International Building Code.*

(Renumber subsequent sections)

[1] "Report of the CTC, Area of Study – Carbon Monoxide Alarms," International Code Council Code Technology Committee, September 22, 2005, Detroit Marriott Renaissance Center, Detroit, Michigan [Available on the ICC website: http://iccsafe.org/cs/cc/ctc/Carbon.html].

[2] Williams, Ted A. "CO Alarm Mandates in Model Codes as Public Policy," presented at ICC Code Technology Committee on CO Alarms, July 26, 2005, Schiller Park, Illinois [Available on the ICC website: http://iccsafe.org/cs/cc/ctc/Carbon.html].

Final Action: AS AM AMPC____ D

M41-06/07, Part III
IFGC 311 (New), Chapter 8

Proposed Change as Submitted:

Proponent: Mark Riley, City of Troy, MI Building Department, representing himself

PART III – IFGC

1. Add new text as follows:

SECTION 311
CARBON MONOXIDE ALARMS

311.1 Where required-new construction dwellings. In new construction, dwelling units within which fuel-fired appliances are installed shall be provided with an approved carbon monoxide alarm installed outside of each separate sleeping area in the immediate vicinity of the bedroom(s).

311.2 Where required-existing dwellings. In existing dwellings where interior alterations, repairs, fuel-fired appliance replacements or additions requiring a permit occur, or where one or more sleeping rooms are added or created, carbon monoxide alarms shall be provided in accordance with Section 311.1.

311.3 Alarm requirements. The required carbon monoxide alarms shall be clearly audible in all bedrooms over background noise levels with all intervening doors closed. Carbon monoxide alarms shall be listed as complying with UL 2034 and shall be installed in accordance with this code and the manufacturer's installation instructions.

311.4 Power source and interconnection. The required carbon monoxide alarms shall be powered by the building wiring where such wiring is supplied by a commercial power source and when such source is interrupted, the alarms shall be battery powered. The power supply wiring shall be permanent and without a disconnecting switch other than the branch circuit overcurrent device.

Where more than one carbon monoxide alarm is required within a dwelling unit, the alarms shall be interconnected in a manner such that the activation of one alarm will cause actuation of all of the alarms within the dwelling.

Exceptions:

1. Alarms installed in existing dwelling units shall not be required to be interconnected and powered by a commercial power source where the work described in Section 311.2 does not result in the removal of interior wall or ceiling finishes thereby exposing the structure and there is no attic, crawl space or basement which could provide access for wiring without the removal of interior finishes.
2. Alarms shall not be required to be interconnected and shall be permitted to be powered only by batteries where installed in buildings without commercial power.

2. Add standard to Chapter 8 as follows:

UL

UL 2034 Standard for Single and Multiple Station Carbon Monoxide Alarms, Edition 2 including revisions through March 8, 2005

Reason: Over 200 a deaths a year in the United States have been contributed to CO Poisoning, and over 10,000 cases where people were admitted to the hospital emergency rooms. Every major safety agency strongly recommends the use of CO detectors. GAMA recommends the use of CO detectors on their website.
C.S.P.C., U.L. and manufacturer's have spent many hours revising U.L. Standard 2034 to provide a more reliable device.
The location requirement is based on research of manufacturer's installation instructions and recommendations from NFPA 720, *Recommended Practice for the Installation of Household Carbon Monoxide (CO) Warning Equipment*

The U.S. Consumer Product Safety Commission (CPSC) recommends that consumers purchase and install carbon monoxide detectors with labels showing they meet the requirements of the new Underwriters Laboratories, Inc (UL) voluntary standard (UL 2034). The UL standard, published in April 1992, requires detectors to sound an alarm when exposure to carbon monoxide reaches potentially hazardous levels over a period of time. Detectors that meet the requirements of UL 2034 provide a greater safety margin than previously-manufactured detectors

Properly working carbon monoxide detectors can provide an early warning to consumers before the deadly gas builds up to a dangerous level Exposure to a low concentration over several hours can be as dangerous as exposure to high carbon monoxide levels for a few minutes - the new detectors will detect both conditions. Most of the devices cost under $100. Each home should have at least one carbon monoxide detector in the area outside individual bedrooms. CPSC believes that carbon monoxide detectors are as important to home safety as smoke detectors are

Bibliography: CPSC document #5010

Cost Impact: There is a slight impact of less than 100 dollars per dwelling

Committee Action:

Disapproved

Committee Reason: CO alarms are not within the scope of the IFGC The ICC CTC committee has not recommended that CO alarms be made mandatory as required by this proposal. It is not clear why the bedroom location was chosen The alarm may not be audible when the bedroom doors are closed The Consumer Product Safety Commission has not endorsed CO alarms as being reliable. The dwelling occupants can install CO alarms if they desire them.

Assembly Action:

Approved as Modified

Modify proposal as follows:

~~311.4 Power source and interconnection. The required carbon monoxide alarms shall be powered by the building wiring where such wiring is supplied by a commercial power source and when such source is interrupted, the alarms shall be battery powered. The power supply wiring shall be permanent and without a disconnecting switch other than the branch circuit overcurrent device.~~

~~Where more than one carbon monoxide alarm is required within a dwelling unit, the alarms shall be interconnected in a manner such that the activation of one alarm will cause actuation of all of the alarms within the dwelling~~

~~**Exceptions:**~~

1. ~~Alarms installed in existing dwelling units shall not be required to be interconnected and powered by a commercial power source where the work described in Section 311.2 does not result in the removal of interior wall or ceiling finishes thereby exposing the structure and there is no attic, crawl space or basement which could provide access for wiring without the removal of interior finishes.~~
2. ~~Alarms shall not be required to be interconnected and shall be permitted to be powered only by batteries where installed in buildings without commercial power.~~

Individual Consideration Agenda

This item is on the agenda for individual consideration because an assembly action was successful and Public Comments were submitted.

Public Comment 1:

David C. Delaquila, GAMA-An Association of Appliance and Equipment Manufacturers, requests Disapproval for Part III.

Commenter's Reason: GAMA believes this proposal should be disapproved on the basis that it unfairly identifies fuel-burning appliances as the only source of carbon monoxide Carbon monoxide alarms should be installed in all residential occupancies, regardless of the type of fuel the appliances use. The recent rash of CO incidents in Washington State (predominantly electric heat pumps) and Texas during power outages as a result of inclement weather reinforces the need for theses devices to be installed in all residential buildings. A large majority of the recent CO incidents was attributed to the misuse of power generators Had these homes had a working CO alarm with battery power backup many of these incidents might have been avoided. Carbon monoxide comes from a variety of sources unrelated to fuel-burning appliances and this proposal does not go nearly far enough to provide safety to all occupancies. Code requirements that address life safety should not fall short of its goal. It should never be the intent of any life safety requirement to protect only a segment of the residential population when a large segment of the population is left unprotected.

Public Comment 2:

Paul K. Heilstedt, Chair, Code Technology Committee (CTC), requests Disapproval for Part III.

Commenter's Reason: The CTC agrees with the action taken by the three code change committees. They correctly note that there are reliability concerns and there is still the question of how long such devices will last before they need replacement As to the text approved by the assembly, this text will literally require all existing dwelling units to be provided with a carbon monoxide alarm when a permit is pulled for the conditions noted, even if the dwelling unit does not have a fuel fired appliance.

The CTC notes the importance of and the need for compliance with the applicable code provisions for equipment maintenance and compliance with equipment installation instructions to control the hazards associated with CO emissions. This is consistent with the position of the Environmental Protection Agency in their report entitled "Protect your family and yourself from carbon monoxide poisoning", EPA-402-F-96-005, October 1996.The report can be downloaded at: http://www.epa.gov/iaq/pubs/coftshl.html

The EPA notes the following:

"So what's a consumer to do?
First, don't let buying a CO detector lull you into a false sense of security. Preventing CO from becoming a problem in your home is better than relying on an alarm. Follow the checklist of DO's and DON'TS above " [The checklist focuses on appliance use, maintenance and care as well as directives to not idle your car in the garage or use gas powered engines in enclosed spaces].

As far as CO detectors, the EPA report states the following:

"A few words about CO detectors

"Carbon Monoxide Detectors are widely available in stores and you may want to consider buying one as a back-up --BUT NOT AS A REPLACEMENT for proper use and maintenance of your fuel-burning appliances. However, it is important for you to know that the technology of CO detectors is still developing, that there are several types on the market, and that they are not generally considered to be as reliable as the smoke alarms found in homes today. Some CO detectors have been laboratory-tested, and their performance varied. Some performed well, others failed to alarm even at very high CO levels, and still others alarmed even at very low levels that don't pose any immediate health risk. And unlike a smoke alarm, where you can easily confirm the cause of the alarm, CO is invisible and odorless so it's harder to tell if an alarm is false or a real emergency."
The code change is well intentioned, and there is indeed a health concern due to carbon monoxide poisoning, but a code mandate for carbon monoxide detectors is not the solution.

Public Comment 3:

Ted A. Williams, American Gas Association, requests Disapproval for Part III.

Commenter's Reason: ICC should disapprove this proposal. The ICC Code Technology Committee has published on the ICC website its recommendation from its Area of Study - Carbon Monoxide Alarms. Its recommendation is as follows:

> "Recommendation: The CTC recommendation is:
> There has not been sufficient justification presented to the CTC to mandate carbon monoxide alarms in new and existing residential type occupancies.
> In making this recommendation, the CTC notes the importance of and the need for compliance with the applicable code provisions for equipment maintenance and compliance with equipment installation instructions to control the hazards associated with CO emissions [1]

This recommendation follows many hours of testimony and presentation of documentation (recorded on the ICC website) on CO alarm issues from a wide variety of stakeholders at CTC meetings in Schiller Park, IL and Detroit, MI. ICC committees should address this recommendation in its deliberations and explain alternative actions to the CTC recommendation.
In addition, the following issues of the ICC proposals support disapproval:

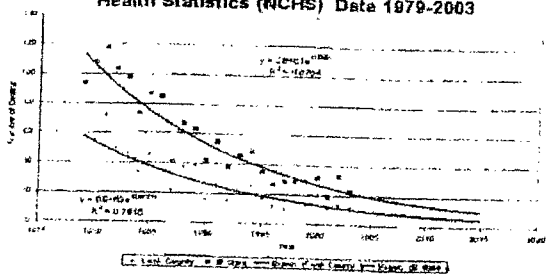
- The U. S. Consumer Product Safety Commission (CPSC), in response to separate letter from the NEMA and Gas Appliance Manufacturers Association (GAMA) requesting CPSC support of CO alarm mandates, has stated that it would not support CO alarm mandates until issues of long term reliability of CO alarms were addressed.
- Issues of alarm reliability have not been addressed in published information on alarm performance. As a result, information to date demonstrates poor performance in the field (including data from first responders documented in the National Fire Investigation Response Data System – NFIRS) and in controlled laboratory tests for mitigating false positive and FALSE NEGATIVE activation. The information provided to the CTC and in the public record documents this information in detail [2]
- The CO alarm proposal is in conflict with NFPA 720, the ANSI-recognized consensus standard for installation and location of CO alarms. In the case of M41, specifically, occupancies with attached garages are excluded, whereas under NFPA 720, these occupancies are included. Other conflicts with NFPA 720 exist as well.
- M41, through its conflicts with NFPA 720 and focus on new and renovated housing, would not have a demonstrable impact on CO fatalities nationally. Even with 100% COMPLIANCE, PERFECT ALARM RELIABILITY, and PERFECT CONSUMER RESPONSE, these proposals might address only about 20% of CO fatalities since current national residential poisoning incidents involve automobiles in attached garages and older housing without renovation or appliance replacement.
- This proposal does not address THE ONLY GROWING CAUSE OF CO FATALITIES – PORTABLE EQUIPMENT, INCLUDING GENERATORS.
- CO alarms are not currently a stable product since UL through its Standards Technical Panel 2034 is addressing fundamental issues of alarm life and even activation points. At its upcoming meeting in October, UL will consider proposals to the UL 2034 standard to address deficiencies documented by CPSC and others. The changes proposed would fundamentally alter the design and performance of CO alarms.
- Experience from the City of Chicago, the first major metropolitan jurisdiction in the U. S. to promulgate mandatory CO alarm installation requirements, illustrates in the plot of CO fatalities below THE INEFFECTIVENESS OF MANDATES.

    - Though promulgated in 1994, Chicago and its collar communities in Cook County (many of which have similar mandates) continue to have CO fatalities. Continuing frequency of CO fatalities around ten per year appears to be stable over time and may be expected to continue in the future.
    - The annual number of deaths in this community is consistent with historical trends of declining CO fatalities over time, but no impact or change in this rate of decline can be attributed to the Chicago mandate.
    - For the mandate to have been effective, either CO fatalities would have had to decrease to zero or near zero, or at a minimum, the rate of CO fatalities would have had to show a discontinuous change that could be associated with the promulgation of the mandate.

Reasons for the ineffectiveness of the Chicago mandate are the subject of speculation and may be attributed to lack of compliance, lack of enforcement, lack of appropriate response, failure of alarms to perform as designed, or these and other factors in combination and discussed in AGA's presentation to the CTC.[2] Nevertheless, the societal cost of the mandate has been significant with no discernable societal benefit.

Cook County and Illinois CO Deaths

Regression Analysis of National Center for Health Statistics (NCHS) Data 1979-2003



[1] "Report of the CTC, Area of Study – Carbon Monoxide Alarms," International Code Council Code Technology Committee, September 22, 2005, Detroit Marriott Renaissance Center, Detroit, Michigan [Available on the ICC website: http://iccsafe.org/cs/cc/ctc/Carbon.html].

[2] Williams, Ted A. "CO Alarm Mandates in Model Codes as Public Policy," presented at ICC Code Technology Committee on CO Alarms, July 26 2005, Schiller Park, Illinois [Available on the ICC website: http://iccsafe.org/cs/cc/ctc/Carbon.html].

Final Action: AS AM AMPC____ D

M44-06/07

403.1, 403.2, 403.2.1, 403.2.2, 403.3, 403.3.1, 403.3.1.1 (New), 403.3.2.3.1 (New), 403.3.2.3.2 (New), 403.3.2.3.3 (New), 403.3.2.3.4 (New) 403.3.1.2 (New), Table 403.1 (New), 403.3.1.3 (New), 403.3.2.1 (New), 403.3.2.2 (New), 403.3.2.3 (New), 403.3.3, Table 403.3, 403.3.4, 403.4 (New), 403.5 (New), 403.6 (New), 403.7 (New), 404.2, 202 (New)

Proposed Change as Submitted:

Proponent: Steven Ferguson, ASHRAE

1. Revise as follows:

403.1 Ventilation system. Mechanical ventilation shall be provided by a method of supply air and return or exhaust air. The amount of supply air shall be approximately equal to the amount of return and exhaust air. The amount of supply air shall be approximately equal to the amount of return and exhaust air. The system shall not be prohibited from producing negative or positive pressure. The system to convey ventilation air shall be designed and installed in accordance with Chapter 6.

~~Ventilation supply systems shall be designed to deliver the required rate of supply air to the occupied zone within an occupied space. The occupied zone shall have boundaries measured at 3 inches (76 mm) and 72 inches (1829 mm) above the floor and 24 inches (610 mm) from the enclosing walls.~~

403.2 Outdoor air required. The minimum ~~ventilation rate of required~~ outdoor airflow rate shall be determined in accordance with Section 403.3. Ventilation supply systems shall be designed to deliver the required rate of outdoor airflow to the breathing zone within each occupiable space.

Exception: Where the registered design professional demonstrates that an engineered ventilation system design will prevent the maximum concentration of contaminants from exceeding that obtainable by the rate of outdoor air ventilation determined in accordance with Section 403.3, the minimum required rate of outdoor air shall be reduced in accordance with such engineered system design.

403.2.1 Recirculation of air. The outdoor air required by Section 403.3 shall not be recirculated. Air in excess of that required by Section 403.3 shall not be prohibited from being recirculated as a component of supply air to building spaces, except that:

1. Ventilation air shall not be recirculated from one dwelling unit to another or to dissimilar occupancies.

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